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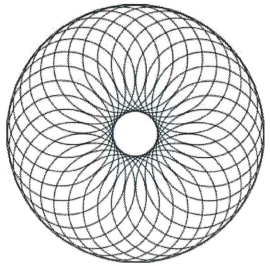
A LEVEL MATHS

YEAR 1 PURE



ANSWERS

ONLY AVAILABLE FROM

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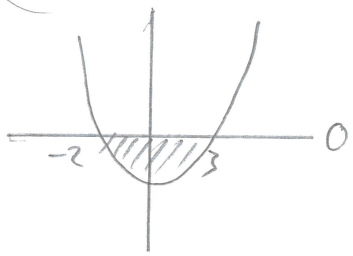
THESE ANSWERS CANNOT BE UPLOADED TO ANY SOCIAL MEADIA PLATFORM OR SOLD ON FOR PROFIT. SCHOOLS CAN USE THEM ON THEIR VLE.

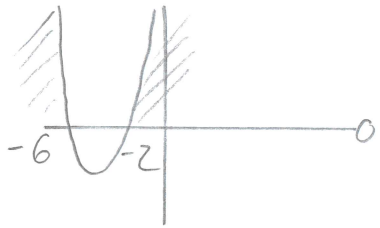
16 Quadratic Inequalities

① $(x-3)(x+2) < 0$



$-2 < x < 3$

② $(x+2)(x+6) \geq 0$

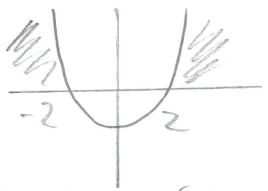


$x \leq -6$ or $x \geq -2$

③ $x^2 \geq 4$

$x^2 - 4 \geq 0$

$(x+2)(x-2) \geq 0$

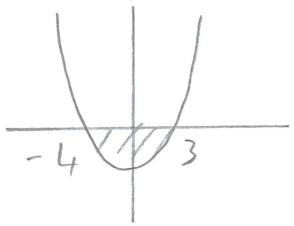


$x \leq -2$ or $x \geq 2$

① $-x^2 < 12 + x$

$0 < x^2 + x - 12$

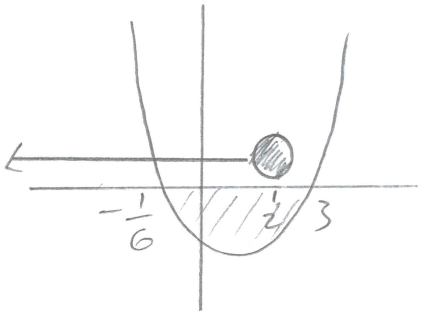
$(x+4)(x-3) < 0$



$-4 < x < 3$

② $6x^2 - 17x - 3 \leq 0$

$(6x+1)(x-3) \leq 0$



$4 \geq 2x$

$2 \geq x$

$\therefore$

$-\frac{1}{6} \leq x \leq 2$

③ $x^2 < 12$

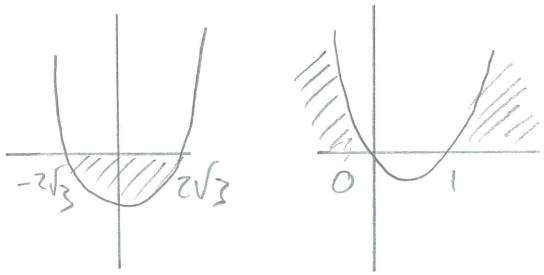
$x^2 - 12 \leq 0$

$(x+2\sqrt{3})(x-2\sqrt{3}) \leq 0$

$x^2 > x$

$x^2 - x > 0$

$x(x-1) > 0$



$\therefore -2\sqrt{3} \leq x < 0$ or $1 < x \leq 2\sqrt{3}$

① $6x^2 + x - 1 \leq 0$

$(2x+1)(3x-1) \leq 0$

$x > \frac{k}{2}$

$\therefore \frac{k}{2} > \frac{1}{3}$ or $\frac{k}{2} < -\frac{1}{2}$

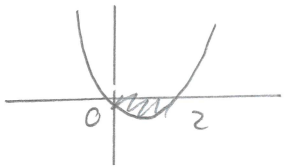
$k > \frac{2}{3}$ or $k < -1$

② $\frac{4}{x} > 2$ $(\times x^2)$

$4x > 2x^2$

$0 > 2x^2 - 4x$

$0 > 2x(x-2)$



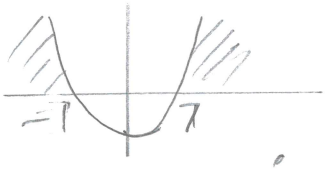
$0 < x < 2$

③ $8(x+1) \leq 1(x+1)^2$

$8x + 8 \leq x^2 + 2x + 1$

$0 \leq x^2 - 6x - 7$

$0 \leq (x-7)(x+1)$



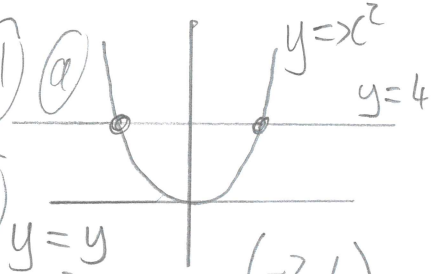
$\therefore$

$-1 \leq x$ or $x \geq 7$

Steve Blades

17 Inequalities on Graphs

1 a)



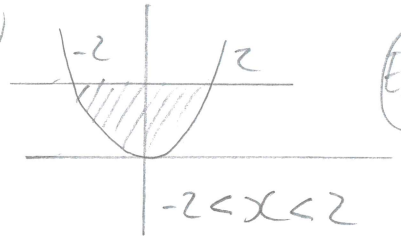
b) $y = y$

$\therefore x^2 = 4$

$x = \pm 2$

$(-2, 4)$ and $(2, 4)$

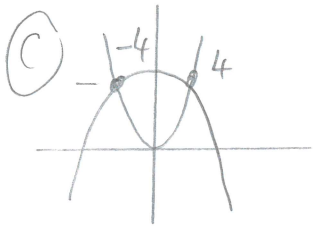
c)



$-2 < x < 2$

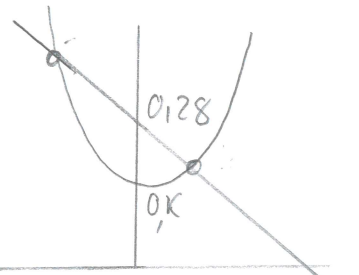
E/D

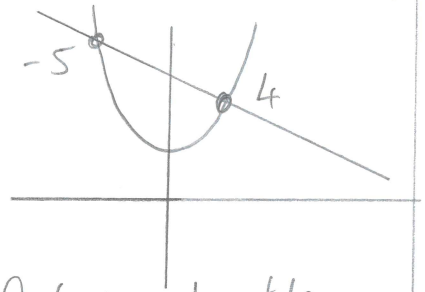
c)



$-4 \leq x \leq 4$

1 a)





Sub 4 into the linear.

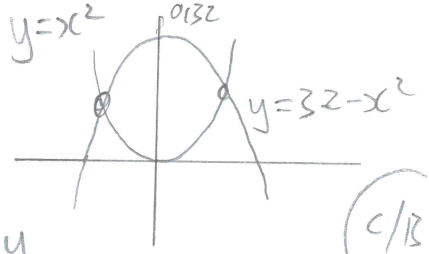
$\therefore 28 - 4 = 24$

$(4, 24)$ must lie on $y = x^2 + k$

$24 = 16 + k$

$k = 8$

1 a)



C/B

$y = y$

$\therefore x^2 = 32 - x^2$

$2x^2 = 32$

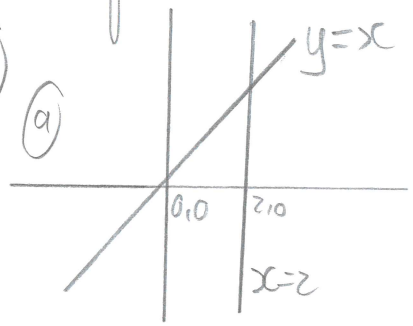
b) $x^2 = 16$

$x = \pm 4$

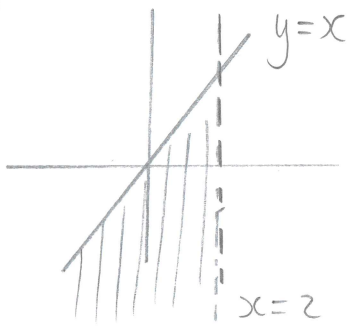
$\therefore (4, 16)$ and $(4, 16)$

(18) Regions (Inequalities)

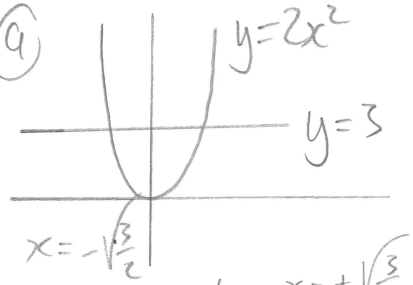
(1) (a)



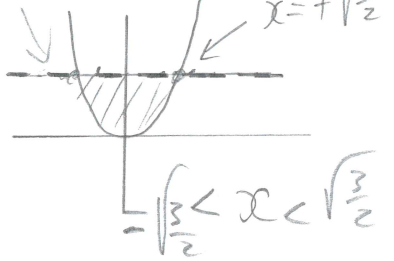
(b) E/D



(2) (a)

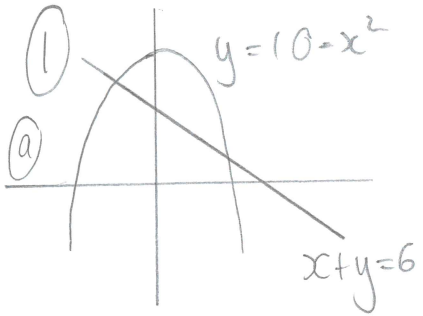


(b)



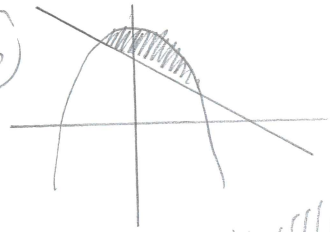
O.E

(1)

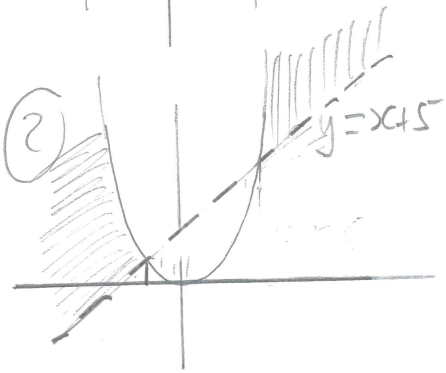


(a)

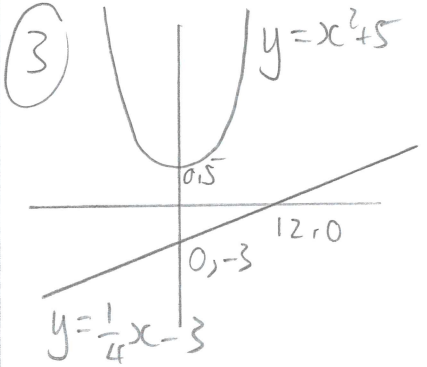
(b) C/B



(2)



(3)



No points of intersection.

(1) (a) $a=4$ ← where the parabola cuts the y axis

(a) $b=6$ ← where the line cuts the y axis.

(b) $y=x^2+4$

$y=6-x$

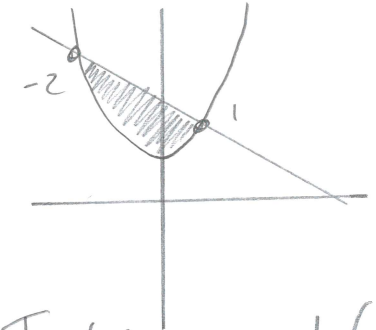
Set $y=y$

$x^2+4=6-x$

$x^2+x-2=0$

$(x+2)(x-1)=0$

C.V: $x=-2, x=1$



Test the point (0,0)

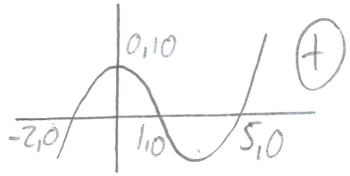
If you want to check

$\therefore -2 \leq x \leq 1$

Steve Blades

Pure 19 Cubic Graphs

(1)

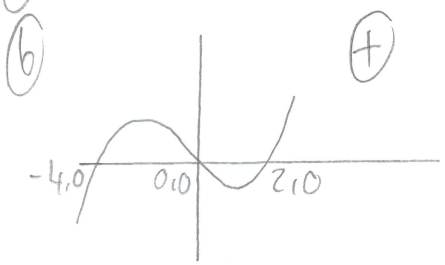


Crosses y axis when $x=0$
Crosses x axis when $y=0$

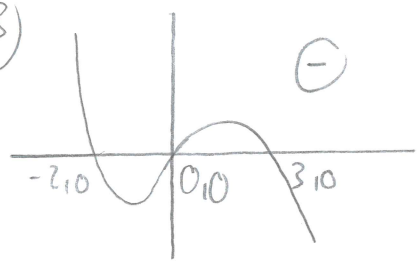
(2) $x(x^2+2x-8)$

(3) $x(x+4)(x-2)$

(b)

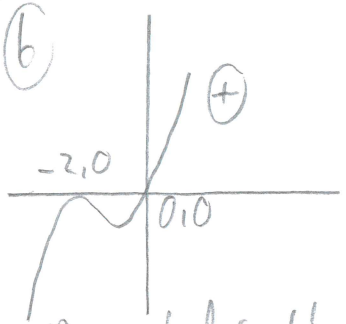


(3)



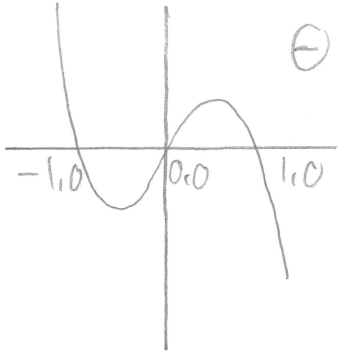
(1)(a) $x(x^2+4x+4)$
$x(x+2)(x+2)$
$x(x+2)^2$

(b)

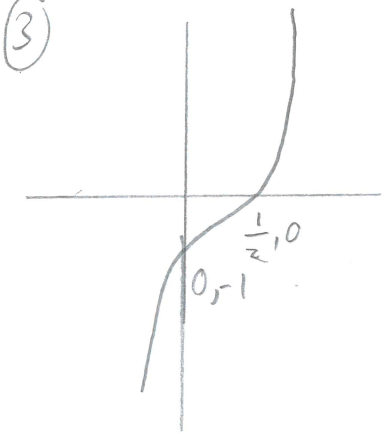


Repeated root!

(2) $y = -x(x^2-1)$
$= -x(x+1)(x-1)$



(3)



(1) $y = 2x^3+bx^2+cx+d$

Sub in values

$(-2,0)$ $0 = -16+4b-2c+d$ (1)

$(1,0)$ $0 = 2+b+c+d$ (2)

$(3,0)$ $0 = 54+9b+3c+d$ (3)

3 unknowns, 3 equations

$16 = 4b-2c+d$ (1)

$-4 = 2b+2c+2d$ (2)

(1)+(2) $12 = 6b+3d$

$-6 = 3b+3c+3d$ (2)

$-54 = 9b+3c+d$ (3)

(2)−(3)

$48 = -6b+2d$

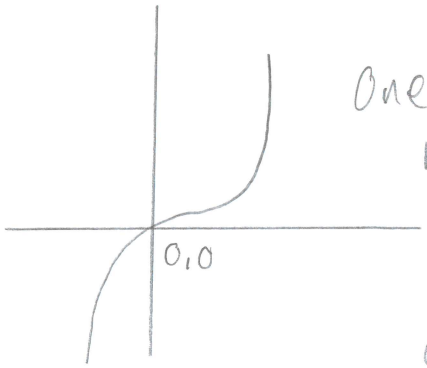
$12 = 6b+3d$
$48 = -6b+2d$
$5d = 60$
$d = 12$

$\therefore b = -4$

Sub $d=12$ and $b=-4$ into (1) (2) or (3)

(2) $0 = 2-4+c+12$
$c = -10$

(2) $y = x(x^2+a)$



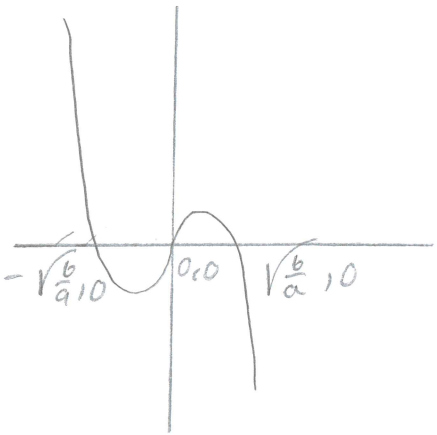
One real root as $x^2+a \neq 0$ for real values of a, $a>0$

(3) $y = -ax^3+bx$
$= -x(ax^2-b)$

$\therefore x=0$ or $ax^2-b=0$

$\downarrow$

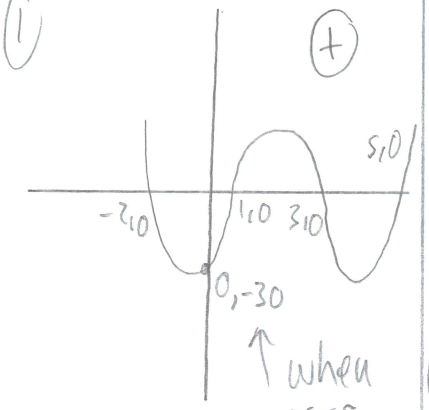
$x = \pm\sqrt{\frac{b}{a}}$ or $\frac{\sqrt{ab}}{a}$



Negative cubic graph

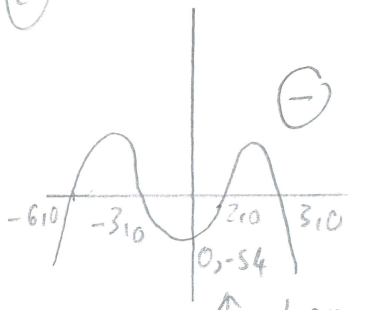
20 Quartic Graphs

1



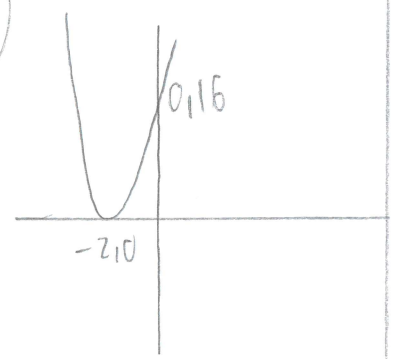
↑ when $x=0$

2

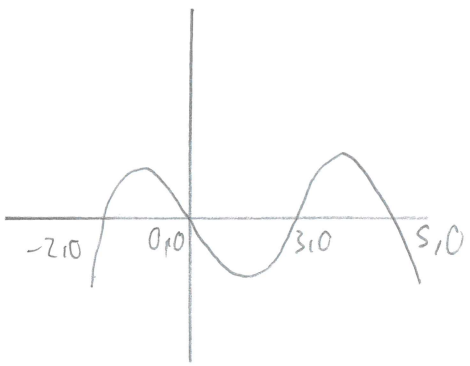


↑ when $x=0$

3



1

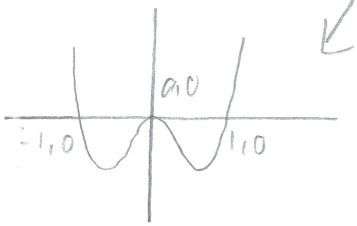


2 (a) $x^4 - x^2$

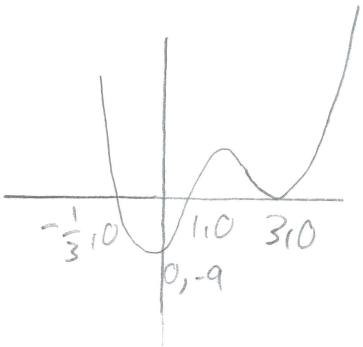
$x^2(x^2-1)$

$x^2(x+1)(x-1)$

(b)



3



① $y = x^2(x+1)(x-1)$

$= x^2(x^2-1)$

$= x^4 - x^2$

$\therefore b=0, c=-1, d=0, e=0$

② Only has 2 roots, both positive

$\therefore y = (x-a)(x-b)(x^2+c)$

when a, b and c are real numbers and all >0.

eg $y = (x-2)(x-5)(x^2+8)$ for example.

Questions at www.m4ths.com